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**Correlations of Octahedral Cations with $OH^-$, $O^{2-}$, $Cl^-$ and $F^-$ in Phlogopite from Volcanic Rocks and Xenoliths**

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In order to understand compositional variation in igneous biotite, full analyses of a suite of biotites of variable composition from volcanic and xenolith parageneses have been completed. Major and minor elements were determined by electron microprobe analysis, water was determined by manometry and SIMS analysis, and $Fe^{3+}/Fe^{2+}$ was determined by microXANES and Mössbauer spectroscopy. XANES data were collected on standard thin sections using a beam size of roughly 10x15 microns. $Fe^{3+}/Fe^{2+}$ was determined for each sample using the calibration line of Bajt et al. (1994). This is the first study to use $Fe^{3+}/Fe^{2+}$ determined by micro-XANES in the analysis of terrestrial igneous biotites.

Our new data, together with previous biotite analyses (total of 52 analyses), reveal correlations between $O^{2-}$ (2-F-Cl-OH) and the sum of the octahedral cations Al+Ti+$Fe^{3+}$+Cr. This correlation allows estimation of either OH- or $Fe^{3+}/Fe^{2+}$ as long as one or the other has been determined. The hydroxyl site in most mantle micas contains at least 1.0 $O^{2-}$ apfu, indicating that the oxy-component cannot be ignored. The large oxy-component in melt inclusion micas from the martian meteorite Chassigny does not necessarily indicate oxidized or hydrous magmatic conditions because dehydrogenation may have occurred and/or because the oxy-component may be stable at low oxygen fugacity. The large variation in Ti, Al and $Fe^{3+}$ in natural igneous micas is most likely dependent upon bulk compositional differences in each specific system such as variation of $a_{TiO2}$ and $a_{Al2O3}$ in silicate melts.

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**Reference:** S. Bajt, S.R. Sutton, J.S. Delaney, "X-ray microprobe analysis of iron oxidation states in silicates and oxides using X-ray absorption near edge structure (XANES)", *Geochim. Cosmochim. Acta* **58**, 5209-5214 (1994).